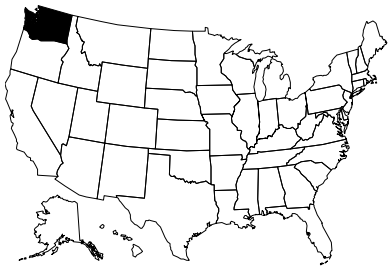
WASHINGTON



Contact Information

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Stream Biological Monitoring website:
http://www.ecy.wa.gov/programs/eap/fw_benth/fwb_intr.html

Program Description

Washington State's Biological Monitoring Program has been operated by the Washington Department of Ecology since 1993. The program has served as a focal point for technical assistance and as a reference for data comparison. Its primary objectives are: 1) to continually describe the spatial and temporal features of biotic communities in wadeable streams, 2) describe and then validate biological expectations for appropriate spatial classifications (e.g., ecoregions), 3) develop guidance and criteria that evaluate human-induced disturbance in biological communities, and 4) expand where biological information is used in water quality and resource management. Although field data collection methodology has remained consistent, data storage and analytical products have improved in their capacity and sophistication.

The Freshwater Monitoring Unit within the Department of Ecology has engaged in biological monitoring activities for more than twelve years and has made its information available online for public use. The primary objectives in continuing to develop this program are to: 1) proceed with calibration of ten biometrics that will be based on reference conditions within each of eight ecoregions, 2) continue assistance in development of RIVPACS (River Invertebrate Prediction and Classification System) models for western and eastern Washington streams with researchers at Utah State University (Dr. C. Hawkins), and 3) locate and visit additional reference sites outside of the ranges currently being monitored.

Interpretive tools developed from these efforts are being placed into the ALUS framework under development by the USEPA (contact Susan Jackson). WA is able to use the knowledge and tools developed through former biological monitoring efforts to create a meaningful matrix of expectations as diagramed by ALUS so that incremental improvements in stream quality, based on biological signatures, can be tracked. The first step toward adoption of biocriteria will be the construction of a guidance that outlines analytical products and biological expectations for streams within each ecoregion of Washington State. Biological evaluation tools such as RIVPACS scores, biometric scores, index scores, and indicator taxa are currently being assembled for inclusion in the guidance.

Biological information is currently being included in the 303(d) listing process to directly evaluate impairment. WA has amassed an adequate data bank for describing reference conditions that serves as an effective and defensible means for comparison. The Freshwater Monitoring Unit issued a report titled "Condition of Freshwaters in Washington State for the Year 2000" that evaluates data from water quality monitoring, biological monitoring, lakes monitoring, and nuisance aquatic plant monitoring. This report was intended as a template for future reviews of environmental information, like the 305(b) report, and will eventually satisfy reporting content of the current required data summaries as well as new guidance like CALM (Consolidated Assessment and Listing Methodology).

Many of the water quality problems of interest to the Department of Ecology's Regional Offices are related to habitat destruction due to human influence. This is one of the areas in which collaborative work with volunteer monitoring groups, local governments, state agencies, tribes, and other federal agencies is promoted.

One important partnership has been with the USEPA and the Environmental Monitoring and Assessment Program (EMAP). The Department of Ecology has engaged both EMAP and R-EMAP (Regional Environmental Monitoring and Assessment Program) since 1994. The acquisition of both knowledge and equipment in operating this program has provided impetus to implement the probabilistic monitoring design in the Ambient River and Stream Water Quality Monitoring Program. WA is working with the Colville Tribe in expanding the description of reference conditions for northeastern Washington and with the Yakima Tribe, county, and federal agencies in evaluating the effects of floodplain gravel mining along the Yakima River. WA is especially encouraged by several volunteer monitoring groups, like Streamkeepers of Clallam County, whose organizers have assembled teams of personnel that generate useful biological, chemical, and flow data.

Documentation and Further Information

2000 Washington State Water Quality Assessment - Section 305(b) Report: http://www.ecy.wa.gov/pubs/0010058.pdf

DRAFT 2002 303(d) List of Impaired and Threatened Waters, May 2002:
http://www.ecy.wa.gov/programs/wq/303d/2002-revised/listpolicydraftfinal7.pdf

Condition of Freshwaters in Washington State for the Year 2000: http://www.ecy.wa.gov/pubs/0103025.pdf

Water Quality Standards for Surface Waters of the State of Washington: http://www.ecy.wa.gov/pubs/wac173201a.pdf

For a comprehensive list of Stream Biological Monitoring Publications available online and/or by mail, go to:
http://www.ecy.wa.gov/programs/eap/fw_benth/fwb_pubs.html

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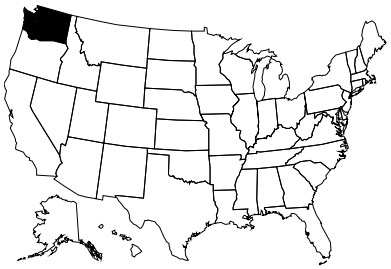

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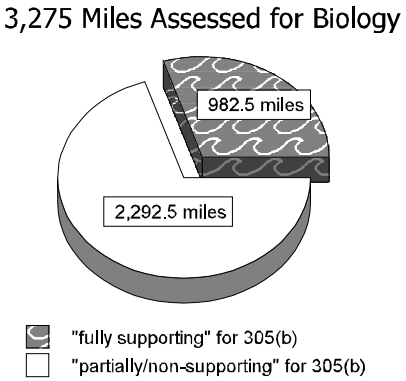
Programmatic Elements

Uses of bioassessment within overall water quality program	✓	problem identification (screening)
	✓	nonpoint source assessments
	✓	monitoring the effectiveness of BMPs
		ALU determinations/ambient monitoring
	UD	promulgated into state water quality standards as biocriteria
		support of antidegradation
		evaluation of discharge permit conditions
	✓	TMDL assessment and monitoring
		other:
Applicable monitoring designs	✓	targeted (i.e., sites selected for specific purpose) *(specific river basins or watersheds)*
	✓	fixed station (i.e., water quality monitoring stations) *(comprehensive use throughout jurisdiction)*
	✓	probabilistic by stream order/catchment area *(stream order as subset of ecoregion sampling)*
	✓	probabilistic by ecoregion, or statewide *(special projects and comprehensive use throughout jurisdiction)*
	✓	rotating basin *(specific river basins or watersheds)*
		other:

Stream Miles

Total miles *(State based determination)*	**73,886**
Total perennial miles	39,483
Total miles assessed for biology*	**3,275**
fully supporting for 305(b)**	982.5
partially/non-supporting for 305(b)**	2,292.5
listed for 303(d)	0
number of sites sampled	655
number of miles assessed per site	5



*Approximately 10% of the State's perennial streams are assessed for biology. The 3,275 total miles assessed for biology is an estimate derived from multiplying 655 sites by the 5 miles assessed per site.

**The "fully supporting" and "partially/non-supporting" for 305(b) stream mile estimates are based on an old assessment policy estimation process. WA most recently used EPA's National Hydrography Data Layer to create the stream segment breaks but the new data has not been generated yet.

Aquatic Life Use (ALU) Designations and Decision-Making

ALU designation basis	Class System (A,B,C)	
ALU designations in state water quality standards	The Water Class system currently in use contains four categories: Class AA, Class A, Class B, and Class C. Class AA (extraordinary) freshwaters shall markedly and uniformly exceed the requirements for all or substantially all uses. Class A (excellent) freshwaters shall meet or exceed the requirements for all or substantially all uses. Class B (good) freshwaters shall meet or exceed requirements for most uses. Class C (fair) freshwaters shall meet or exceed the requirements of selected and essential uses.	
Narrative Biocriteria in WQS*	under development	
Numeric Biocriteria in WQS	none	
Uses of bioassessment data in integrated assessments with other environmental data (e.g., toxicity testing and chemical specific criteria)	✓	assessment of aquatic resources
	✓	cause and effect determinations
	✓	permitted discharges
	✓	monitoring (e.g., improvements after mitigation)
	✓	watershed based management
Uses of bioassessment/ biocriteria in making management decisions regarding restoration of aquatic resources to a designated ALU	none	

*Water Classes AA, A, and B include a characteristic use designation called "Wildlife Habitat." This characteristic use designates waters of the state used by, or that directly or indirectly provide food support to fish, other aquatic life, and wildlife for any life history stage or activity. The term "biological assessment" is defined in Washington's water quality standards and is intended to be used to evaluate the condition of "Wildlife Habitat."

Reference Site/Condition Development

Number of reference sites	**187 total**	
Reference site determinations		site-specific
		paired watersheds
	✓	regional (aggregate of sites)
	✓	professional judgment
		other:
Reference site criteria	1) Least-disturbed sites that show little or no signs of human impact, 2) Relatively-unimpacted sites that show some signs of historical human influence but are at an advanced successional stage	
Characterization of reference sites within a regional context	✓	historical conditions
	✓	least disturbed sites
		gradient response
		professional judgment
	✓	other: minimally disturbed (see "relatively-unimpacted" reference site criteria)
Stream stratification within regional reference conditions	✓	ecoregions (or some aggregate)
		elevation
	✓	stream type
		multivariate grouping
		jurisdictional (i.e., statewide)
		other:
Additional information		reference sites linked to ALU
		reference sites/condition referenced in water quality standards
	✓	some reference sites represent acceptable human-induced conditions

Field and Lab Methods

Assemblages assessed	✓	benthos *(100-500 samples/year; single season, multiple sites - watershed level and broad coverage)*
	✓	fish *(100-500 samples/year; single season, multiple sites - watershed level and broad coverage)*
	✓	periphyton *(<100 samples/year; single season, multiple sites - watershed level and broad coverage)*
	✓	other: macrophytes and waterfowl *(<100 samples/year; single season, multiple sites - watershed level and broad coverage)*
Benthos		
sampling gear		Surber, D-frame; 500-600 micron mesh
habitat selection		riffle/run (cobble); pool habitat may also be assessed if physical and/or chemical degradation has occurred and can be detected through a biotic response
subsample size		500 count
taxonomy		family, genus, and species
Fish		
sampling gear		backpack electrofisher; 7 millimeter mesh
habitat selection		multihabitat
sample processing		length measurement, anomalies
subsample		none - all specimens are examined and counted
taxonomy		species, life stage
Periphyton		
sampling gear		**natural substrate:** brushing/scraping device (razor, toothbrush, etc.); **artificial substrate:** collect by hand
habitat selection		multihabitat
sample processing		taxonomic identification
taxonomy		genus
Habitat assessments		visual based, quantitative measurements and hydrogeomorphology; performed with bioassessments
Quality assurance program elements		standard operating procedures, quality assurance plan, periodic meetings and training for biologists, sorting and taxonomic proficiency checks, specimen archival

Data Analysis and Interpretation

Data analysis tools and methods	✓	summary tables, illustrative graphs
		parametric ANOVAs
	✓	multivariate analysis
	✓	biological metrics *(aggregate metrics into an index)*
		disturbance gradients
Multimetric thresholds		
transforming metrics into unitless scores		25th percentile of reference population
defining impairment in a multimetric index		25th percentile of reference population
Multivariate thresholds		
defining impairment in a multivariate index		Significant departure from mean of reference population
Evaluation of performance characteristics	✓	repeat sampling *(multi-year sampling at gradient of sites)*
	✓	precision *(multi-year sampling at reference sites)*
		sensitivity
		bias
		accuracy
Biological data		
Storage		All biological (including habitat and chemistry) information is stored in MS Access
Retrieval and analysis		SAS, Systat, CANOCO, Primer, Cornell Ecology Programs, and Calibrate